

Title: DEVICE, ASSEMBLY, AND METHOD FOR HOLDING A
 PIECE IN A BORE

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CROSS-REFERENCE TO RELATED APPLICATION

 This application claims the benefit of Application No.
60/399,704 filed August 1, 2002 incorporated herein by
reference.

5 BACKGROUND OF THE INVENTION

 This invention relates to a device, assembly, and
method for holding a piece, such as a fastener, in a bore.
The invention will be described in its application to
fastener retainers, but it will become apparent that the
10 invention has broader utility.

 The use of fastener retainers to pre-attach bolts,
studs, or other fasteners to a workpiece, such as a panel,
in preparation for a subsequent assembly operation is well
known. In a typical general application, a bolt (or other
15 fastener) is inserted into a plastic annular retainer which
is designed to retain the bolt within a smooth-walled bore
of a workpiece. The retainer, which has an outer diameter

slightly larger than that of the bore, is pressed into the bore, where it is held by resilient frictional engagement with the bore wall, thus pre-attaching the bolt to the workpiece. The workpiece may subsequently be associated
5 with a second workpiece having a threaded bore which is axially aligned with the bore of the first workpiece, and the two workpieces may then be securely assembled to each other by engaging the bolt with the threaded bore of the second workpiece. See, for example, U.S. Patent Nos. RE
10 36,164 and 6,039,525.

In a typical specific application, to minimize manual labor on an engine assembly line where oil pans are attached by bolts to engine blocks, fastener retainers can be used to pre-attach bolts to the oil pan, and the
15 assembly of the oil pan and the bolts in their retainers can be moved to an assembly line for attachment to an engine block. Such pre-attachment improves production efficiency by eliminating the need for manual placement of the fasteners as parts of the engine assembly operation.

20 In using fastener retainers, it is often important that the holding power of the retainer to the fastener and the holding power of the retainer to the workpiece bore be such that the retained fastener may, if inadvertently

bumped, slide axially of the retainer without the retainer slipping out of the workpiece bore. It is also desirable to provide a retainer that accommodates misalignment of bores and that permits the fastener to be tilted relative to the axis of the retainer. Furthermore, it is desirable that the design of the retainer readily accommodate varying requirements for retainer holding power and varying fastener and bore diameters, and that the retainer be capable of being manufactured simply and economically.

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SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved device, assembly, and method for holding a piece in a bore, and more particularly, to provide an improved fastener retainer and method of using the retainer.

It is another object of the invention to provide a device of the foregoing type that is readily adaptable to varying requirements for holding power and that is capable of being manufactured simply and economically.

It is a further object of the invention to provide a unique spacer or washer.

The foregoing objects, as well as other aspects, features and advantages of the invention, will be more

fully appreciated from the following description of preferred embodiments taken in conjunction with the accompanying drawings.

5 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded perspective view showing the use of an assembly of the invention including a piece-holding device, e.g., a bolt retainer, and a piece to be held, e.g., a bolt.

10 Fig. 2 is a perspective view of a piece-holding device according to the invention.

Fig. 3 is a side elevation view of the piece-holding device.

Fig. 4 is an end view of the piece-holding device.

15 Fig. 5 is a sectional view taken along line 4-4 in Fig. 4.

Fig. 6 is a similar sectional view of a modification.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

20 As shown in Figs. 1-5 an embodiment of a device 10 according to the invention comprises a cylindrical sleeve 12, preferably chamfered at its opposite ends, as shown. A fastener engaging structure is constituted by a single

internal bead or rib 14 extending circumferentially of the sleeve. The bead may be formed as a bulge directly on a central portion of the inner surface of the sleeve or may be connected to the inner surface by an intervening thin web 16 which allows the bead 14 to be resiliently displaced more easily. To provide additional flexibility to the bead structure, a slit 18 may be formed along the circumferential length of the bead. If desired, a plurality of bead sections may be formed by providing a plurality of such slits.

The sleeve 12 and the bead 14 are integrally formed of a resilient flexible plastic, such as a polyester elastomer. For example, the sleeve and the bead can be manufactured by injection molding of a plastic such as high density polyethylene.

In one embodiment, the bead is of substantially circular or oval cross-section, as shown in Fig. 5, while in another embodiment, the bead is of substantially rectangular cross section, as shown by bead 20 in Fig. 6. The innermost portion of the bead defines an inner diameter which is slightly smaller than an outer diameter of the shank of a fastener to be used with the retainer. Upon insertion of the fastener into the sleeve, from either end,

the shank (e.g., thread crests in the case of a bolt) engages the bead and displaces the bead slightly axially and outwardly. The bead resiliently presses against the fastener shank to hold the fastener within the retainer.

5 The holding power of the retainer to the fastener can readily be designed as desired by appropriately selecting the configuration and dimensions of the bead and/or the web at the interface of the bead and the inner surface of the sleeve.

10 Fig. 1 illustrates the use of a retainer 10 of the invention (representative of the use of all embodiments) for holding a bolt 22 in a bore 24 of a body 26. Typically, the retainer 10 will be pre-assembled with the bolt 22, and the resulting assembly will then be inserted
15 into and frictionally engaged with the bore 24 of the body 26, thus pre-attaching the bolt to the body. However, the retainer may first be pressed into the bore and then the bolt inserted into the retainer.

The outer diameter of the sleeve 12 is slightly
20 greater than the inner diameter of the bore 24 to allow for resilient frictional engagement of the sleeve with the wall of the bore. The diameters of the outer surface of the sleeve and the bore wall are preferably sufficiently close

to one another to avoid buckling of the sleeve within the bore, whereby essentially the entirety of the cylindrical outer surface of the sleeve between the chamfered ends will be in engagement with the opposed cylindrical inner surface of the bore.

When the shank 28 of the bolt 22 is pressed into the retainer 10, the outer surface of the shank (typically the crests of the threads in the case of a bolt) engages the bead 14 and thereby deflects the bead axially and slightly outwardly. As a result, the bead centers the bolt within the sleeve of the retainer and holds the bolt within the retainer. As is apparent in Fig. 1, the bolt 22 may project from the bore 24 of the body 26 for engagement with a threaded bore 30 of a second body 32, thereby to join the second body 32 to the first body 26. The bodies may be panels to be joined, for example.

The construction of the invention accommodates misalignment of the bolt 22 and the retainer 10 as well as misalignment of the bodies 26 and 32 to be joined. It is preferred that the frictional force between the outer surface of the sleeve 12 of the retainer 10 and the inner surface of the bore 24 be greater than the frictional force between the bolt 22 and the retainer 10, so that adjustment

of the bolt relative to the retainer does not shift the
retainer relative to the bore. Mechanical characteristics
of the plastic material of the retainer and the design of
the retainer must provide enough strength to keep the bolt
5 securely in the body 26 in which the bolt 22 and the
retainer 10 are inserted.

While preferred embodiments of the invention have been
shown and described, those skilled in the art will
recognize that various changes can be made without
10 departing from the principles and spirit of the invention,
the scope of which is defined in the appended claims. For
example, a device 10 of the invention may be used as a
spacer or a washer and may be used in multiples to provide
a group of such devices spaced apart for holding a pin or
15 stud in a long bore.